

# THE SKYRAY



***"THE CLEAN, GREEN, FLYING MACHINE"***

**THE UNIVERSITY OF VIRGINIA AEROSPACE DESIGN TEAM**

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**MAY 6, 2012**

## Abstract

The need for more environmentally friendly aircraft has become apparent in recent decades, paralleling an exponential growth in air traffic. Implementing newer, more efficient aircraft designs among cargo transports is a significant stepping stone towards revolutionizing the entire air transport industry. This report highlights the design of an incredibly efficient, high-performance cargo transport. The SKYRAY meets and exceeds NASA N+2 solicitation goals regarding fuel burn, NO<sub>x</sub> emissions, and noise reduction established for the 2020-2025 timeframe. It utilizes many of the design options associated with NASA's Environmentally Responsible Aviation project. This sleek, state-of-the-art hybrid-wing-body has the potential to revolutionize the cargo transport industry from a flight efficiency and operational cost stand point. This aircraft, dubbed the SKYRAY, is also designed to be optionally manned by utilizing autonomous flight control and assisted pilot systems. This consideration is aligned with NASA's goal of incorporated unmanned air systems in the national airspace.

## The NASA ARMD University Design Competition

2011-2012 Challenge: Design and simulate flight characteristics and direct operating costs for a large cargo aircraft that can meet NASA's Environmentally Responsible Aviation and Unmanned Air Systems project goals. Design goals include reduction of noise, emissions, and fuel burn for a typical cargo mission of 6,500 miles and a payload of 100,000 lbs. Nominal Mach number is 0.85, but should be varied as part of the design/cost trade space with respect to environmental objectives and business goals and constraints of typical large cargo carriers. Advanced direct and geared turbofans, as well as open rotor or ducted fan propulsion systems, and subsequent propulsion airframe integration challenges and approaches, should be considered. Impact of reducing the number of pilots in the cockpit on the aircraft design, environmental objectives, and its direct operating costs should be explored. Cost of remote pilots and remote control systems must be considered as well.